MATHEMATICAL MODELLING OF POLLUTANT CONCENTRATION DISTRIBUTION IN RIVER

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This is my present to my beloved husband, parents, family and for those who are always believes and appreciates in the richness of learning.

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ABSTRACT

In recent years, the interest in preserving the quality of water for distribution processes in order to maximize the fulfillment of various sectors has considerably increased. Be it domestic sources, industrial or agricultural effluents, the massive increase of industrial productions accompanied by high growth of large urban populations has led to severe water pollution problems. Therefore, to identify water pollution, water quality models becomes an important tool to recognize the behaviors of pollutants in water environment. In this dissertation, the most important objective is to understand and formulate a mathematical model involving the study of pollutant transport in water environment via an advection-diffusion equation in river. The analytical solution of the model is found using Laplace transform method. Once the equation is solved, the solution is plotted using Maple for an easier analysis of the result. Graph of concentration of the pollutant against distance will be interpret and discuss. The result suggests that the concentration of pollutant is decrease against distance.

ABSTRAK

Dalam tahun-tahun kebelakangan ini, kepentingan mengekalkan kualiti air bagi proses pengagihan untuk memaksimumkan memenuhi pelbagai sektor telah meningkat dengan banyaknya. Sama ada sumber dalam domestik, pengaruh industri atau pertanian, peningkatan secara besar-besaran pengeluaran industri yang disertai dengan pertumbuhan penduduk bandar besar telah membawa kepada masalah pencemaran air yang teruk. Oleh itu, untuk mengenalpasti masalah pencemaran air, model kualiti air menjadi alat penting untuk mengenalpasti ciri-ciri bahan pencemar dalam sumber persekitaran air. Dalam disertasi ini, objektif paling penting adalah untuk memahami dan merangka model ringkas matematik yang melibatkan kajian dalam aliran bahan pencemar dalam persekitaran melalui persamaan olahan-resapan dalam sungai. Penyelesaian analisis model didapati dengan menggunakan kaedah Laplace. Setelah persamaan tersebut diselesaikan, penyelesaiannya akan di plot dengan menggunakan perisian Maple untuk menganalisis keputusan yang diperoleh. Graf kepekatan bahan pencemar terhadap jarak akan ditafsir dan dibincangkan. Hasilnya menunjukkan bahawa kepekatan bahan pencemar berkurangan terhadap jarak.